Virgin Islands Water Resources Research Institute
Annual Technical Report
FY 2017

Introduction

The United States Virgin Islands (USVI) is a Territory of the United States of America and consists of a group of several islands and cays located in the Lesser Antilles which separate the Atlantic Ocean and the Caribbean Sea. The USVI is about 1,200 miles southeast of Miami, Florida and 80 miles east of Puerto Rico. The principal islands in the USVI are St. Croix, St. Thomas, St. John and Water Island. Several of the other smaller islands in recent years have undergone various stages of development. In total, the islands have a combined area of approximately 137 square miles, are of volcanic origin and are mountainous. Tourism is the principal source of support for the economy.

With an annual rainfall of just over 40 inches, the USVI is one of the few places in the world where rain water harvesting is required by law. Buildings are constructed with cisterns that are sized and managed to provide a reliable and relatively safe water supply for users. Because of the hilly terrain and antecedent geology, there are virtually no natural surface water supplies. Ground water is limited due to the geology and the risk of salt-water intrusion that could occur from coastal wells. The increasing potable water demands are met largely through rain water collection and the use of reverse osmosis plants that provide water to the public through water distribution systems run by the Water & Power Authority. The islands experience challenges in collecting and disposing of wastewater, and water conservation and increasing efficiency in water-use are critical components of effective water resources management in the USVI.

The Virgin Islands Water Resources Research Institute (VI-WRRI) is hosted by the University of the Virgin Islands (UVI). UVI is the Territory's only institution of higher education and has campuses on the islands of St. Croix and St. Thomas and a research station on St. John. It is a Historically Black College or University (HBCU) and a land-grant institution. It was started in 1962. Though UVI is primarily an undergraduate institution, it offers graduate programs in teacher education, business administration, public administration, marine and environmental science and mathematics for secondary education teachers. The University's demographics reflect the local population in that it consists of a diversified mix of USVI residents and persons from the Caribbean region, the United States' mainland and other areas of the world.

The VI WRRI maximizes all resources available to it, to serve the water resources research, information dissemination, and training needs of the people of the U. S. Virgin Islands that might not be a priority in other settings. It works collaboratively with USVI stakeholders, other units at UVI, territorial and federal agencies, with researchers in the U.S. Geological Survey's Islands Region, and others, to address issues of local, regional, national, and international importance. Areas of focus in the past have included quantity and quality issues of water harvesting, development of alternative on-site sewage disposal systems and non-point source pollution in island environments. Funds in 2017 were proposed to support the following activities: (1) education and training of one Masters and three undergraduate students at UVI, (2) expansion, enhancement, and evaluation of the "Water Ambassador Program," an educational water resource and conservation program for middle school students across the three main USVI islands, and (3) established three new high-precision precipitation monitors on existing Caribbean Coastal Ocean Observing System (CARICOOS) meteorological stations , and (4) a joint conference that was to be convened in the U.S. Virgin Islands of the four island, USGS water resources research institutes (Hawaii, Guam, Puerto Rico, and the U.S. Virgin Islands).

In September 2017, two Category 5 hurricanes, Irma and Maria, struck the U.S. Virgin Islands (USVI) during a single 12-day period, an event unprecedented in U.S. history. The storms destroyed critical infrastructure, including territorial schools and parts of the University of the Virgin Islands, and heavily disrupted and continues to disrupt people's lives. Many USVI residents evacuated the Territory following the storms (including WRRI Director, Grimes); others lived without power for 3-5 months. Eight months after the storms, many U.S. Virgin Islands residents are still recovering, working to repair damaged homes, adjust to new working conditions, and mend family situations.

These natural disasters drastically changed people's living and working conditions. The University of the Virgin Islands (UVI) and territorial grade schools were heavily damaged as a result of the storms; most schools closed for several months because of damage or because they were functioning as community shelters. Ten schools permanently closed due to structural damage caused by the storms, while the remaining schools have opened on a staggered schedule from mid-October through mid-November. Schools are being run on split sessions between middle school and high school classes with students only attending class for a portion of the school day.

UVI sustained $51 million dollars in damage to both of its campuses on the islands of St. Thomas and St. Croix, from the storms. The Center for Marine & Environmental Studies, which includes the office for WRRI Director Grimes and the Water Resources Lab, was destroyed and has been uninhabitable since its roof came off during Hurricane Irma. With other UVI buildings heavily damaged, intermittent generator power, and continuing internet connectivity and phone communication issues, university employees are adjusting to the "new normal" for working conditions, which seem to be improving each day, but remain a significant challenge.

Delays in full funding from the USGS until June 2017 and then the impacts from the two Category 5 hurricanes, Irma and Maria, that struck the U.S. Virgin Islands in September 2017, significantly delayed or halted progress on the 2017-18 projects, resulting in a request for no-cost project extensions to the USGS in January 2018 for continuation or reprogramming of these funds into the 2018-2019 program year. Therefore, this Annual Report only includes brief project updates for each of the 2017 projects.

Research Program Introduction

One VI-WRRI project was supported through the Research Program during the 2017-2018 program year: “The USVI-Climate Monitor: Unifying Precipitation Monitoring Across the St. Thomas Microclimates.”

The USVI-Climate Monitor: Unifying Precipitation Monitoring Across the St. Thomas Microclimates

Basic Information

Title:	The USVI-Climate Monitor: Unifying Precipitation Monitoring Across the St. Thomas Microclimates
Project Number:	2017VI269B
Start Date:	3/1/2017
End Date:	2/28/2018
Funding Source:	104B
Congressional District:	USVI
Research Category:	Climate and Hydrologic Processes
Focus Categories:	Drought, Water Supply, Agriculture
Descriptors:	None
Principal Investigators:	David C Morris, Roy A Watlington, Norton Brice Orange, William Douglas Wilson

Publications

There are no publications.

One VI-WRRI project was supported through the Research Program during the 2017-2018 program year: “The USVI-Climate Monitor: Unifying Precipitation Monitoring Across the St. Thomas Microclimates.” Due to the delay in receipt of full funding from the USGS until June 2017 and because of the impacts sustained by Hurricanes Irma and Maria to the University of the Virgin Islands and partners, damage to the weather station infrastructure itself, and continued recovery, there was limited progress for this project during 2017-2018. However, there are some project updates to report.

During the summer of 2017, UVI undergraduate student Calwyn Morton traveled to Washington D.C. and spent 10 weeks working with U.S. Department of Agriculture (USDA) researchers Brad Rippey and Mark Brusberg (both from the USDA Office of the Chief Economist/World Agriculture Outlook Board) to learn the formatting details for data to be input to the U.S. Drought Monitor program. During his research at the USDA, Calwyn learned the details of the standardized precipitation index (SPI) and also traveled to the University of Nebraska where he presented his work to a team of meteorologists regarding the precipitation data being collected at the University of the Virgin Islands and this project’s plans for incorporating those data into the National Drought Monitor program. At the end of Calwyn's summer project, it was anticipated that he would return to UVI and help to facilitate regular uploads of USVI drought monitor data in the appropriate formats for use by the U.S. Drought Monitor. While the impact of Hurricanes Irma and Maria in the USVI region prevented this work from being completed in the ensuing nine months, the project team anticipates returning to this work shortly.

The current plan for installation of weather stations outlined in the proposal and modified as needed in response to the impact of the hurricanes is as follows: Ocean and Coastal Observing – Virgin Islands, Inc. (OCOVI) and WeatherFlow Inc. will install two rain gauges at agreed-upon locations in the existing Virgin Islands network. It was previously determined that the two locations that fulfill the optimum combination of ease of maintenance and representativeness of the region were at Crown Mountain on St. Thomas and Sandy Point Wildlife Refuge on St. Croix. The impacts of the hurricanes however, necessitate that WeatherFlow inspect all existing mesonet stations (these sites as well as at Two Brothers and Buck Island, St. Thomas). This would allow corroboration or alteration of earlier choices.

Weatherflow will combine installation with maintenance at these sites as follows:
First, WeatherFlow will visit mesonet stations at Two Brothers, Buck Island, Rupert Rock and Crown Mountain to finalize the choices of location for the St. Thomas-St. John rain gauge and to prepare them for full return to the meteorological network. With regard to the site originally planned for Crown Mountain, where a whole new pedestal may be needed, it may be necessary for WeatherFlow to revive or replace the station, provide the needed maintenance, and conduct the needed engineering to install the precipitation gauge. Finally, the third leg of the maintenance trip will involve transiting to St. Croix to inspect and retune the Sandy Point mesonet station and install the precipitation gauge at that location.

A no-cost extension has been requested for this project for the 2018-2019 funding year. The project PI and partners anticipate they will be able to fulfill the grant deliverables (modified as needed due to the hurricanes), for this project with the no-cost extension.

Information Transfer Program Introduction

One VI-WRRI project was proposed to be supported through the Information Transfer Program during the 2017-2018 program year: the Water Ambassador Program III.

Water Ambassador Program III

Basic Information

Title:	Water Ambassador Program III
Project Number:	2017VI267B
Start Date:	3/1/2017
End Date:	2/28/2018
Funding Source:	104B
Congressional District:	USVI
Research Category:	Climate and Hydrologic Processes
Focus Categories:	Education, Water Supply, Hydrology
Descriptors:	None
Principal Investigators:	christina marie chanes, David Morris, Stanley L. Latesky, Norton Brice Orange

Publications

There are no publications.

One VI-WRRI project was proposed to be supported through the Information Transfer Program during the 2017-2018 program year: the Water Ambassador Program III. Due to the delay in receipt of full funding until after the conclusion of the 2017 Virgin Islands School Year (June 2017), and because of Hurricanes Irma and Maria (two Category 5 hurricanes that struck the U.S. Virgin Islands in September 2017), which heavily damaged island infrastructure and resulted in the closure of many schools and complete restructuring of the school system for the 2017-2018 school year, this project did not occur.

Requests to the USGS in January 2018 asked to reprogram funds for the Water Ambassador Program III, after discussions with the project PI who indicated that the project was no longer feasible due to the significant infrastructure and other challenges faced by territorial schools following the storms. It has been requested that these funds be used to help re-build the VI WRRI lab which was destroyed by Hurricane Irma and to support other VI WRRI needs.

USGS Summer Intern Program

None.

Student Support					
Category	**Section 104 Base Grant**	**Section 104 NCGP Award**	**NIWR-USGS Internship**	**Supplemental Awards**	**Total**
Undergraduate	1	0	0	0	1
Masters	2	0	0	0	2
Ph.D.	0	0	0	0	0
Post-Doc.	0	0	0	0	0
Total	3	0	0	0	3

Notable Awards and Achievements

The USVI Drought Workgroup, comprised of individuals from the VI WRRI, the University of the Virgin Islands, and a local business, continue to make progress toward experimental inclusion in the U.S. Drought Monitor. The Workgroup developed an automated application program interface to capture data from the 8 global historical climatology network (GHCN) weather stations available for the USVI (4 on St. Croix, 2 on St. John, and 2 on St. Thomas) to calculated standardized precipitation indices, a critical metric for experimental inclusion in the U.S. Drought Monitor. Inclusion, even on an experimental basis is critical because it is a mechanism for automatically triggering a drought declaration should one occur, rather than through personal appeal from the territory's governor to the U.S. Secretary of Agriculture. In Spring 2017, we received a response to our letter to U.S. Secretary of Agriculture, Tom Vilsack, to advocate for the USVI's experimental inclusion in the U.S. Drought Monitor. He was encouraging of inclusion. In Summer 2017, the USVI Drought Workgroup met with authors of the U.S. Drought Monitor and individuals from the National Drought Mitigation Center to share our tool and discuss next steps, including creation of an on-the-ground observational drought network. Hurricanes Irma and Maria destroyed 4 of the GHCN stations which are no longer reporting data and derailed progress towards the goal of experimental inclusion in the U.S. Drought Monitor, but conversation were reinitiated in Spring 2018 with key individuals at the USDA. There is still strong, territorial support for experimental inclusion in the U.S. Drought Monitor, including support from Congresswoman Plaskett, Governor Map, Virgin Islands Department of Agriculure, and other stakeholders in the region, particularly USVI farmers.

VI WRRI-supported Masters student, Amelie Jensen, successfully defended her Masters thesis, "Predictors of and variability in seagrass sediment blue carbon from St. Thomas, U.S. Virgin Islands" and graduated from the Marine & Environmental Science Program at the University of the Virgin Islands in May 2018. Amelie and VI WRRI Director, Kristin Grimes, were selected as 1 of 11 mentee-mentor pairs chosen nationally, to participate in the Coastal & Estuarine Research Federation's "Rising TIDES (Toward an Inclusive, Diverse and Enriched Society) Mentoring Program" at the 2017 biennial meeting.

VI WRRI personnel and VI-WRRI supported work was well-represented at international and national professional conferences (*indicates student):

Grimes, K.W., J. Keller*, A.S. Reeve. 2017. Mangroves protect U.S. Virgin Islands marine protected area from heavy metal contamination from nearby landfill. Oral presentation, 2017 Society of Wetland Scientists Annual Meeting, San Juan, Puerto Rico, June 2017.

Durdall*, A., S. Nick, R. Nemeth, K.W. Grimes. 2017. Great Pond, St. Croix, USVI: quantifying changes to a fish nursery habitat over 20 years. Oral presentation, 24th Biennial Conference of the Coastal & Estuarine Research Federation, Providence, RI, November 2017.

Jensen*, A., K.W. Grimes, E. Smith, and M. Brandt. 2017. Variability in blue carbon storage in seagrass habitats of St. Thomas, U.S. Virgin Islands. Oral presentation, 24th Biennial Conference of the Coastal & Estuarine Research Federation, Providence, RI, November 2017.

Nick, S. and K.W. Grimes. 2017. Spatial and temporal trends of Enterococcus in the U.S. Virgin Islands. Oral presentation, 24th Biennial Conference of the Coastal & Estuarine Research Federation, Providence, RI, November 2017.

Grimes, K.W., M. Brandt, C.J. Bucklin, N. Jones, M. Medina. 2017. Supporting Emerging Aquatic Scientists (SEAS) Your Tomorrow: Engaging U.S. Virgin Islanders in the Marine Sciences. Oral presentation, 24th Biennial Conference of the Coastal & Estuarine Research Federation, Providence, RI, November 2017.

Grimes, K.W., C.J. Bucklin, S. Habtes, H. Forbes, Jr., M. Taylor, C. Goodwin. 2017. Efforts to Reduce Land-Based Sources of Marine Debris in the U.S. Virgin Islands. Oral presentation, 24th Biennial Conference of the Coastal & Estuarine Research Federation, Providence, RI, November 2017.

VI WRRI Director, Kristin Grimes, gave a TEDx St. Thomas talk about the importance of diversity and inclusion in STEM. A recording of the talk can be viewed here: https://www.youtube.com/watch?v=2YFfuuMRojA